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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/065,711	11/12/2002	Ching-Yu Chang	JCLA9374	4262

23900 7590 05/28/2004

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EXAMINER

DUDA, KATHLEEN

ART UNIT

PAPER NUMBER

1756

DATE MAILED: 05/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/065,711

Applicant(s)

CHANG, CHING-YU

Examiner

Kathleen Duda

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
  - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
  - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
  - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 18 March 2004.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 14-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 14-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

1. Claims 1-12 and 14-20 are pending in this application.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 1, 3, 4, 10, 12, 14, 19 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Adair (US Patent 5,959,325).

Adair discloses a patterning process. A first resist layer 360 is deposited, exposed and developed to form a regular grating pattern having lines in the direction of the x-axis or y-axis. A second layer of resist 380 is then deposited, exposed and developed to form a second pattern of lines orthogonal to the first direction. The second pattern is in a non-grating "dog-bone" shape (i.e. varying length). See example 3 in columns 11-12.

Applicant argues, in reference to claims 1-9, that Adair lacks the memory cells. Adair teaches integrated chips and DRAM device. Claim 1 recites memory chip. Applicant argues, in reference to claims 10+, that the first set of lines being formed by a photoresist is not taught. Adair in the abstract teaches a sacrificial layer and then refers to a second layer of resist, inferring that the first layer was a resist. Depositing, exposing and developing are common processing steps to form a photoresist pattern. Applicant argues that the shape of Adair is regular. The shape is not a claimed embodiment.

4. Claims 1-3, 5, 7-12, 14-16, 19 and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Hwang (US Patent 6,664,028).

Hwang discloses a patterning method. A first negative photoresist layer 120 is formed on an insulation layer 110, exposed and developed. A KrF (248 nm) excimer laser is used to form parallel strips spaced from each

other with a pitch/size. A post exposure bake (hardening) is performed, prior to development. A second positive photoresist layer 130 is formed, exposed using a KrF excimer laser and developed. The parallel strips formed in the second photoresist layer are perpendicular to the strips formed in the first photoresist layer. Square opening 140 are formed from the overlapping of these parallel strips. The width of each opening is about 0.1 microns (about  $\frac{1}{2}$  of the wavelength of light) (column 2, lines 1-40). Please note that half of the wavelength of the exposure light is 0.124 microns, which is 0.10 microns or 0.12 microns, depending on the number of significant digits used, thereby meeting the limitations of claim 9.

Applicant argues, in reference to claims 1-9, that Hwang does not teach memory cells. Hwang teaches a semiconductor device on a wafer. Column 3, lines 59-65, teach memory device. Applicant argues, in reference to claims 10+, that Hwang does not teach trenches of different lengths. This is recited in claim 4 which is not part of this rejection.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having

ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Adair or Hwang as applied to claim 1 above, and further in view of Furukawa (US Patent 6,303,272)\*.

The teachings of Adair and Hwang have been discussed above. The references individually teach a patterning method for forming orthogonal patterns using two photoresist layers with separate exposure and development steps. The references do not disclose exposing the photoresists to off-axis illumination. Furukawa also teaches a patterning method for forming orthogonal patterns using two photoresist layers, exposed and developed in two separate steps. Such orthogonal features may also be exposed using conventional off-axis illumination in order to further enhance the resulting image (column 5, lines 25-37). It would have been obvious to one of ordinary skill in the art to expose the photoresist layers to off-axis illumination in the methods of Adair or Hwang because Furukawa teaches that these orthogonal features may be further enhanced by exposing the two photoresist layers to conventional image enhancement processes, such as off-axis illumination.

7. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hwang as applied to claim 16 above, and further in view of Ng (US Patent 5,876,903).

The teachings of Hwang have been discussed above. While Hwang discloses hardening the first photoresist pattern (using a post-exposure bake), the reference does not disclose hardening the photoresist by implanting Ar or N<sub>2</sub> ions with a dosage of about  $1 \times 10^{14}$  to about  $3 \times 10^{15}/\text{cm}^2$  at an energy of about 2 to about 50 KeV. Ng teaches a method for hardening a photoresist layer which allows the photoresist pattern to withstand subsequent exposure to etchants and other chemicals. A typical ion implantation would comprise implanting Ar ions at  $1 \times 10^{15}/\text{cm}^2$  at an energy of about 40 KeV (column 4, lines 35-46). It would have been obvious to one of ordinary skill in the art to have hardened the first photoresist pattern by implanting Ar or N<sub>2</sub> ions with a dosage of about  $1 \times 10^{14}$  to about  $3 \times 10^{15}/\text{cm}^2$  and an energy of about 2 to about 50 KeV in the method of Hwang because Ng teaches that hardening a photoresist by ion implantation, such as by implanting Ar ions at  $1 \times 10^{15}/\text{cm}^2$  at an energy of about 40 KeV, will allow the photoresist pattern to withstand subsequent exposure to etchants and other chemicals.

8. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hwang as applied to claim 16 above, and further in view of Furihata (US Patent 5,618,892).

The teachings of Hwang have been discussed above. While Hwang discloses hardening the first photoresist pattern using post-exposure bake, the reference is silent on the baking conditions and does not disclose baking at a temperature from about 100-150°C at about 30-180 seconds. Furihata teaches that a typical post-exposure bake of a negative photoresist exposed at 248 nm is at a temperature of about 80-130°C for about 1-5 minutes (column 6, lines 33-41). It would have been obvious to one of ordinary skill in the art to have performed the post-exposure bake of the first photoresist pattern at a temperature of about 100-150°C for about 30-180 seconds in the method of Hwang because Furihata teaches that a typical PEB process for a negative photoresist is at a temperature of about 80-130°C for about 1-5 minutes.

### ***Response to Amendment***

9. The arguments in regards to Adair and Hwang have been discussed above. No arguments were presented in regards to the secondary references sued in the 35 USC 103 rejections.



***Conclusion***

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

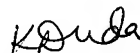
11. Any inquiry concerning this communication should be directed to Examiner K. Duda at (571) 272-1383. Official FAX communications should be sent to (703) 872-9306.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff, can be reached at 571-272-1385.

Information regarding the status of an application may be obtained from the Patent Application Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public

Art Unit: 1756

PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Kathleen Duda  
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Art Unit 1756